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10/663,366

09/15/2003

Ronald Kuse

10559/858001/P17306/Intel

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EXAMINER

CHEN, KEATH T

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

02/05/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/663,366	<b>Applicant(s)</b> KUSE, RONALD	
	<b>Examiner</b> KEATH T. CHEN	<b>Art Unit</b> 1792	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 November 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6,8-12,14,15,23,24,26-28 and 30-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-12,14,15,23,24,26-28 and 30-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. Applicants' amendment, filed on 11/11/2008, addressing claims 7-12 and 25-28 rejection and allowance of claims 1-6, 14, 15, 23, 24, 30-41 and 47 from the non-final office action (08/15/2008), by amending claims 8, 26, and 42 and cancelling claims 7 and 25 is entered.

The indicated allowability of claims 1-6, 14, 15, 23, 24, 30-41, and 43 is withdrawn in view of previous cited reference Horie et al. (US 6419462) and the newly discovered reference to Lebouitz et al. (US 20020033229). Rejections based on the newly cited reference(s) follow. Therefore, this action is made non-final.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 8 and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 8 and 26 each depends on cancelled claims 7 and 25. There is insufficient antecedent basis for this limitation in the claim. Claims 7 and 25 will be examined as dependent on claim 1 and 23, respectively.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**3. Claims 1-6, 8, 14-15, 23-24, 26, and 30-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al. (US 20020033229, hereafter '229), in view of Murray (US 5168543, hereafter '543).**

'229 teaches some limitations of:

Claim 1: A semiconductor processing system (Fig. 3, for example) comprising: a variable volume chamber (#26, [0033], line 10) to provide gas (xenon difluoride and nitrogen, [0033], lines 10-16) consumed in a semiconductor process (etching, [0033]), wherein the variable volume chamber defines a variable interior volume and comprises a piston ([0035], last two sentence); a precursor boat (mesh #201 in cylinder #119 that holds XeF<sub>2</sub>, Fig. 9B, [0056], mesh is considered as a boat for the same function of holding the precursor material (#200, [0057])); cylinder #119 is equivalent to source #25 in Fig. 3), a pressure detector (pressure measuring device #21 or #20, [0033], second last sentence) to detect a parameter indicative of a pressure of gas inside the variable volume chamber (#21, directly connected to etching chamber #27, is indicative of a

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pressure of gas inside the variable volume chamber too, when valve #10 is opened) and to produce an output indicative thereof; and a pressure controller (computer that sets etch desired etch pressure, [0042], third sentence; and by controlling the rate of expansion chamber collapse from the etch pressure set point [0047]; and the rate of collapse is under motor control [0039], possibly with the aid of RGA control of the process, [0052]) in communication with the pressure detector and the variable volume chamber, the pressure controller to apply a force (rate of collapse is a force) to the variable volume chamber based on the output of the pressure detector and thereby vary the variable interior volume to regulate the pressure of the gas inside the variable volume chamber.

Claim 23: A chemical reactant delivery system (Fig. 3, for exmaple) comprising: a variable volume chamber (#26) comprising a piston ([0035], last two sentence), having an outlet (from #26 to #27), and defining a variable interior volume, the outlet to deliver a reactant gas ( $\text{XeF}_2$ , [0033], lines 10-16) from an interior region of the variable volume chamber to a reaction chamber (#26); a precursor boat (mesh #201 in cylinder #119 that holds  $\text{XeF}_2$ , Fig. 9B, [0056], mesh is considered as a boat for the same function of holding the precursor material; cylinder #119 is equivalent to source #25 in Fig. 3) configured to hold a liquid or a solid source (#200, [0057]) of the reactant gas; a pressure detector (pressure measuring device #21 or #20, [0033], second last sentence) to detect a parameter indicative of a pressure of the reactant gas inside the variable volume chamber (#21, directly connected to etching chamber #27, is indicative of a pressure of gas inside the variable volume chamber too) and to produce an output

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indicative thereof; and a pressure controller (computer that sets etch desired etch pressure, [0042], third sentence; and by controlling the rate of expansion chamber collapse from the etch pressure set point [0047]; and the rate of collapse is under motor control [0039], possibly with the aid of RGA control of the process, [0052]) in communication with the pressure detector and the variable volume chamber, the pressure controller to apply a force (rate of collapse is a force) to the variable volume chamber based on the output of the pressure detector and thereby vary the variable interior volume to regulate the pressure of the reactant gas inside the variable volume chamber.

Claim 41: A semiconductor processing system (Fig. 3, fore example) comprising: a variable volume chamber (#26) to provide gas consumed in a semiconductor process, wherein the variable volume chamber comprises a piston ([0035], last two sentence); a precursor boat (mesh #201 in cylinder #119 that holds XeF<sub>2</sub>, Fig. 9B, [0056], mesh is considered as a boat for the same function of holding the precursor material; cylinder #119 is equivalent to source #25 in Fig. 3) configured to hold a liquid or a solid source (#200, [0057]) of gas consumed in a semiconductor process; a pressure detector (pressure measuring device #21 or #20, [0033], second last sentence) to detect a parameter indicative of a pressure of gas inside the variable volume chamber (#21, directly connected to etching chamber #27, is indicative of a pressure of gas inside the variable volume chamber too) and to produce an output indicative thereof; and a pressure controller (computer that sets etch desired etch pressure, [0042], third sentence; and by controlling the rate of expansion chamber collapse from the etch

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pressure set point [0047]; and the rate of collapse is under motor control [0039], possibly with the aid of RGA control of the process, [0052]) in communication with the pressure detector and the variable volume chamber, the pressure controller to apply a force (rate of collapse is a force) to the piston based on the output of the pressure detector and thereby regulate the pressure of the gas inside the variable volume chamber.

Claim 43: A chemical reactant delivery system (Fig. 3, for example) comprising: a variable volume chamber (#26) having an outlet (between #26 and #27) and comprising a piston ([0035], last two sentence), the outlet to deliver a reactant gas (XeF<sub>2</sub>, [0033], lines 10-16) from an interior region of the variable volume chamber to a reaction chamber; a precursor boat (mesh #201 in cylinder #119 that holds XeF<sub>2</sub>, Fig. 9B, [0056], mesh is considered as a boat for the same function of holding the precursor material; cylinder #119 is equivalent to source #25 in Fig. 3) configured to hold a liquid or a solid source (#200, [0057]) of the reactant gas; a pressure detector (pressure measuring device #21 or #20, [0033], second last sentence) to detect a parameter indicative of a pressure of the reactant gas inside the variable volume chamber (#21, directly connected to etching chamber #27, is indicative of a pressure of gas inside the variable volume chamber too) and to produce an output indicative thereof; and a pressure controller (computer that sets etch desired etch pressure, [0042], third sentence; and by controlling the rate of expansion chamber collapse from the etch pressure set point [0047]; and the rate of collapse is under motor control [0039], possibly with the aid of RGA control of the process, [0052]) in communication with the

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pressure detector and the variable volume chamber, the pressure controller to apply a force (rate of collapse is a force) to the piston based on the output of the pressure detector and thereby regulate the pressure of the reactant gas inside the variable volume chamber.

'229 teaches the source boat/mesh in a separate cylinder (#25) instead of inside the variable volume chamber.

'229 does not teach the limitations of:

Claim 1: (a precursor boat) inside the variable volume chamber and configured to hold a liquid or a solid source of gas consumed in a semiconductor process.

Claims 23, 41, and 43: (a precursor boat) inside the variable volume chamber.

'543 is an analogous art in the field of evaporating material for deposition (abstract), particularly in expansion volume (title). '543 teaches placing source/precursor in a thermal expandable/variable volume chamber (See vapor source with bellow #44, Fig. 2, col. 2, lines 3-27 and col. 4, lines 7-19).

At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to have placed the source to the expansion volume chamber, as taught by '543 (Fig. 2), from cylinder #25 to chamber #26 in the apparatus



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in Fig. 3 of '229, for the purpose/motivation to evaporate accurately and quickly, as taught by '543 (col. 2, lines 3-6).

For claims 1, 23, 41, and 43, '229 discloses the claimed invention except for placement of the precursor/ source. It would have been an obvious matter to rearrange the precursor/source location, since it has been held that rearranging parts of an invention only involves routine skill in the art. MPEP 2144.04 VI C.

'229 further teaches the limitations of:

Claim 3: The system of claim 1, further including a processing chamber, and wherein the variable volume chamber (#26) is to provide a precursor material to the processing chamber (#27, [0039]).

Claim 4: The system of claim 3, wherein the precursor material is to react with another material (the substrate to be etched) in the processing chamber.

Applicant's claim requirement "the precursor material is to react with another material" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ

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235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Claims 14 and 42: The system of claim 1 (or 41), wherein the parameter indicative of the pressure is a force on the piston (the pressure sensor is in fluid communication with piston and therefore, indicative to a force on the piston).

Claims 15 and 30: The system of claim 1 (or 23), further including another variable volume chamber (as shown in Figs. 5, 6, 10-12, these embodiments meets the limitations of claims 1 and 23 too).

Claims 31 and 32: The semiconductor processing system of claim 1 (or 23), wherein the pressure controller comprises a mechanically moveable member (motor, [0039]) to apply the force to the variable volume chamber.

Claims 36 and 40: The semiconductor processing system of claim 3 (or 23), further comprising a thermal isolation region between the processing chamber and the variable volume chamber (the connection pipe between #26 and #27 provide thermal resistance; furthermore, the temperature of various components are not kept at the same temperature, [0042] second last sentence, requires thermal isolation).

'543 teaches the limitations of:

Claim 5: The system of claim 1, wherein the semiconductor process is a chemical vapor deposition process (field of the invention; furthermore, this is considered intended use, see discussion above).

Claim 6: The system of claim 1, wherein the semiconductor process is an atomic layer deposition process (the apparatus is capable of by feeding appropriate gases in sequence).

Claims 8 and 26: The system of claim 1 or 23 (sic 7 or 25), wherein the variable volume chamber (#44) is included in a pressurization region (between #44 and the outer wall of crucible #16, Fig. 2).

The above combination further teaches the limitations of:

Claims 2 and 24: The system of claim 1 (or 23), wherein the pressure controller comprises a constant pressure controller to keep the pressure of the gas inside the variable volume chamber substantially constant (both '229 and '543 teach the use of bellow. The expansion of bellow requires a constant pressure. It would be obvious to operate piston similar to the delivery by bellow; furthermore, to keep pressure substantially constant is a common well-known control mode. This constant pressure control is suitably applicable in the combined apparatus).

Applicant's claim requirement "to keep the pressure of the gas inside the variable volume chamber substantially constant" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim

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(*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Claims 33 and 37: The semiconductor processing system of claim 1 (or 23), further comprising a temperature control device (resistance heater, claim 10 of '543, or #19 of '229 after incorporating precursor boat into #29) to control the temperature of the precursor boat.

Claims 34 and 38: The semiconductor processing system of claim 33 (or 37), wherein the temperature control device comprises a heater in thermal communication with the precursor boat (resistance heater, claim 10 of '543, or #19 of '229 after incorporating precursor boat into #29, are in thermal contact with the precursor boat).

Claims 35 and 39: The semiconductor processing system of claim 33 (or 37), wherein the temperature control device is to control the temperature of the precursor boat based on the output of the pressure detector ('229 teaches the temperature control is a function of pressure to avoid XeF<sub>2</sub> solidifies, [0008] and [0012] and Fig. 2).

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**4. Claims 9, 10, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over '229 and '543, further in view of Yoshioka et al. (US 20020043215, hereafter '215).**

'229 and '543, together, teach all limitations of claims 8 and 26, as discussed above.

'229 and '543, together, do not teach the limitations of:

Claims 9 and 27: The system of claim 8 (or 26), wherein the pressure controller comprises a gas source to selectively communicate with the pressurization region.

Claim 10: The system of claim 9, wherein the gas source is to selectively communicate with the pressurization region when the pressure of the gas inside the pressurization region is below a desired pressure.

Applicant's claim requirement "when the pressure of the gas inside the pressurization region is below a desired pressure" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in

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the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

'215 is an analogous art in the field of vaporizer to delivery liquid reagent (abstract and field of the invention) for CVD ([0004]). '215 teaches pressure control of the space S between bellow (#311, Fig. 25, [0137]) and the outer chamber wall (#313) by a gas source (through charge gas line #5).

At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a charged gas line between the bellow (or piston) and outer wall, as taught by '215, in the combined apparatus of '229 and '543, for the purpose/motivation of avoiding moisture being absorbed into liquid precursor ([0138], last sentence).

**5. Claims 9-12 and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over '229 and '543, further in view of Sturm (WO 99/04060, hereafter '060).**

'229 and '543, together, teach all limitations of Claims 8 and 26, as discussed above.

'229 and '543, together, do not teach the limitations of:

Claims 9 and 27: The system of claim 8 (or 26), wherein the pressure controller comprises a gas source to selectively communicate with the pressurization region.

Claim 10: The system of claim 9, wherein the gas source is to selectively communicate with the pressurization region when the pressure of the gas inside the pressurization region is below a desired pressure.

Claims 11 and 28: The system of claim 8 (or 26), wherein the pressure controller comprises a vacuum source to selectively communicate with the pressurization region.

Claim 12: The system of claim 11, wherein the vacuum source is to selectively communicate with the pressurization region when the pressure of the gas inside the pressurization region is above a desired value.

Applicant's claim requirement "when the pressure of the gas inside the pressurization region is above a desired value" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or

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functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

'060 is an analogous art in the field of vaporizer to delivery liquid reagent (field of the invention) for CVD ([0004]). '060 teaches pressure control of exterior of the variable volume chamber by a gas source and a vacuum line (Fig. 7, left hand side, page 15, lines 18-26).

At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a gas source and a vacuum line to the exterior of the variable volume chamber/pressurization region, as taught by '060, to the combined apparatus of '229 and '543, for the purpose/motivation of constant delivery and refill in cyclical process, as taught by '060 (page 15, lines 24-25).

### ***Response to Arguments***

6. Applicant's arguments filed 11/11/2008 have been fully considered.
7. In regarding to 35 USC 112 rejection of claim 42, Applicant's amendment overcomes the rejection. However, amendments of claims 8 and 26 raised similar 35 USC 112 rejection, as discussed above.
8. The new examiner apologizes the withdraw of previous allowance based on the new ground of rejection.



***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T. C./  
Examiner, Art Unit 1792  
/Ram N Kackar/  
Primary Examiner, Art Unit 1792